QTE Command Reference

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Version 1.0

Sony Computer Entertainment Inc.

Confidential

Limiters:

During some calculation processing, calculation results, data values in registers, etc., are clipped when they exceed specified upper limit and lower limit values. In other words, data values lower than the lower limit value are converted to the lower limit value, and data values higher than the upper limit value are converted to the upper limit value. Also, the occurrence of such conversions is reflected in out-of-bounds data detection flags in the FLAG register. These functions are referred to as "limiters."

The usage of the various limiters and the codes used to specify them in this documentation are listed below.

Calculation error detection:

Overflow and underflow detection are performed only for certain specific calculation operations. In this documentation, the calculation test result flag number is listed between angle brackets < > to the right of calculation operations that are subject to such detection.

Code Specification	Limiter	Out-of-bounds detect bit	Lower limit	Upper limit	Comments
A1S	A1	24	-2^{15}	$2^{15}-1$	
A2S	A2	23	-2^{15}	$2^{15}-1$	
A3S	A3	22	-2^{15}	$2^{15}-1$	
A1U	A1	24	0	$2^{15}-1$	
A2U	A2	23	0	$2^{15}-1$	
A3U	A3	22	0	$2^{15}-1$	
A1C	A1	24	0 or -2^{15}	$2^{15}-1$	Lower limit val is specified using lim argument.
A2C	A3	23	0 or -2^{15}	$2^{15}-1$	Lower limit val is specified using lim argument.
A3C	A3	22	0 or -2^{15}	$2^{15}-1$	Lower limit val is specified using lim argument.
B1	B1	21	0	$2^{8}-1$	
B2	B2	20	0	$2^{8}-1$	
B3	B3	19	0	$2^{8}-1$	
C	C	18	0	$2^{16}-1$	
D1	D1	14	-2^{10}	$2^{10}-1$	
D2	D2	13	-2^{10}	$2^{10}-1$	
E	E	12	0	$2^{12}-1$	

Explanation:

Character attributes	Example	Content
Underline	VAL	Intermediate value (No corresponding register)
Emphasis character	OBJ	32-bit value

Code	Meaning
limX()	Limiter application X is the limiter designation code.

<-	FIFO data transfer
	Example: a <- b <- c <- d; is equivalent to the following:
	  a = b;
	  b = c;
	  c = d;

^	Power Example: a^b means "a to the power of b".
==	Argument value condition
n=0,1,2 {}	Repeat the process between the curly parentheses {} three times, substituting 0, 1, and 2 for n.
(a.b.c)	Fixed-point number Sign portion: a bits, integer portion: b bits, fractional portion: c bits
(-.b.-)	b-bit binary data
<n>	Calculation subject to overflow and underflow testing The test result is reflected in cumulative test flag n in the FLAG register.

Descriptor examples:

(A)   A = B;

--> A=B is executed for the fixed-point expression (1.15.0).

(B)
(1.15.0) IR0 = limX(SSX);

Limiter:

Code	Lower limit	Upper limit
limX	-2^{15}	$2^{15}-1$

--> The 32-bit value SSX is rounded using the limiter specified by X. The fixed-point expression (1.12.0) representing the results obtained is substituted for IR1.

(C)
n=0,1,2{

  (1.3.12)L1n
  = limA(LL1n);

}

--> For the fixed-point expression (1.3.12), the following are executed:
L10=limA(LL10);
L11=limA(LL11);
L12=limA(LL12);

(D)
sf==0   sf==1
(1.31.0) (1.19.12) A = B;
--> B is substituted for A. However, the value is converted into a 32-bit signed fixed-point number with no fractional part if sf is 0, and with a 12-bit fraction if sf is 1.

Command details:
Command details are listed on the pages which follow.

Command list:

Command	Required cycles	Function
RTPS	14	Coordinate transformation & perspective transformation
RTPT	22	Coordinate transformation & perspective transformation
NCDS	19	Light source calculation
NCDT	44	Light source calculation
NCCS	17	Light source calculation
NCCT	39	Light source calculation
CDP	13	Light source calculation
CC	11	Light source calculation
NCS	14	Light source calculation
NCT	30	Light source calculation
MVMVA	8	Matrix calculation
DCPL	8	Depth cueing
INTPL	8	Interpolation
DPCS	8	Depth cueing
DPCT	17	Depth cueing
SQR	5	Vector squaring
AVSZ3	5	Z-averaging
AVSZ4	6	Z-averaging
NCLIP		Normal clipping
OP	6	Outer product
GPF	5	General purpose interpolation
GPL	5	General purpose interpolation

RTPS

Function: Coordinate transformation and perspective transformation.

Required cycles:14

Calculations:

Format	Equation
(1.31.12)	SSX = TRX + R11*VX0 + R12*VY0 + R13*VZ0; <1>
(1.31.12)	SSY = TRY + R21*VX0 + R22*VY0 + R23*VZ0; <2>
(1.31.12)	SSZ = TRZ + R31*VX0 + R32*VY0 + R33*VZ0; <3>
(1.15. 0)	IR1 = limA1S(SSX);
(1.15. 0)	IR2 = limA2S(SSY);
(1.15. 0)	IR3 = limA3S(SSZ);
(0.16. 0)	SZx(0) <- SZ0(1) <- SZ1(2) <- SZ2(3) <- limC(SSZ);
(1.15. 0)	SX = OFX + IR1*(H/SZ); <4>
(1.15. 0)	SY = OFY + IR2*(H/SZ); <4>
(1.27.16)	SX = OFX + IR1*(H/SZ); <4>
(1.27.16)	SY = OFY + IR2*(H/SZ); <4>
(1.15. 0)	P = DQB + DQA*(H/SZ); <4>
(1.19.24)	P = DQB + DQA*(H/SZ); <4>
(1. 3.12)	IR0 = limE(P)
(1.15. 0)	SX0 <- SX1 <- SX2 <- limD1(SX);
(1.15. 0)	SY0 <- SY1 <- SY2 <- limD2(SY);
(1. 7.24)	MAC0 = P;
(1.31. 0)	MAC1 = SSX;
(1.31. 0)	MAC2 = SSY;
(1.31. 0)	MAC3 = SSZ;

Referenced registers:

#	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LG2,LG3
18	SZ1(2)	LB1,LB2
19	SZ2(3)	LB3,
20	R0,G0,B0	RFC
21	R1,G1,B1	GFC
22	R2,G2,B2	BFC
23		OFX
24	MAC0	OPY
25	MAC1	H,
26	MAC2	DQA
27	MAC3	DQB
28	IRGB	ZSF3,
29	ORGB	ZSF4,
30	DATA32	
31	LZC	FLAG

Modified registers:

#	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LG2,LG3
18	SZ1(2)	LB1,LB2
19	SZ2(3)	LB3,
20	R0,G0,B0	RFC
21	R1,G1,B1	GFC
22	R2,G2,B2	BFC
23		OFX
24	MAC0	OPY
25	MAC1	H,
26	MAC2	DQA
27	MAC3	DQB
28	IRGB	ZSF3,
29	ORGB	ZSF4,
30	DATA32	
31	LZC	FLAG

RTPT

Required cycles:22

Function: Coordinate transformation and perspective transformation_

Calculations:

n=0,1,2 {

(1.31.12)	$SSXn = TRX + R11*VXn + R12*VYn + R13*VZn;$ <1>
(1.31.12)	$SSYn = TRY + R21*VXn + R22*VYn + R23*VZn;$ <2>
(1.31.12)	$SSZn = TRZ + R31*VXn + R32*VYn + R33*VZn;$ <3>
(0.16. 0)	$SZx(0) = SZ2(3);$
(0.16. 0)	$SZ0(1) = limC(SSZ0);$
(0.16. 0)	$SZ0(2) = limC(SSZ1);$
(0.16. 0)	$SZ0(3) = limC(SSZ2);$
(1.27.18)	$SXn = OFX + IR1*(H/SZ\ n);$ <4>
(1.27.18)	$SYn = OFY + IR2*(H/SZ\ n);$ <4>
(1.19.24)	$P = DQB + DQA*(H/SZ2);$ <4>
(1. 3.12)	$IR0 = limE(P);$
(1.15. 0)	$SXn = limD1(SXn);$
(1.15. 0)	$SYn = limD2(SYn);$

}

(1.15. 0)	$IR1 = limA1S(SSX2);$
(1.15. 0)	$IR2 = limA2S(SSY2);$
(1.15. 0)	$IR3 = limA3S(SSZ2);$
(1. 7.24)	$MAC0 = P;$
(1.31. 0)	$MAC1 = SSX2;$
(1.31. 0)	$MAC2 = SSY2;$
(1.31. 0)	$MAC3 = SSZ2;$

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Function: Light source calculation

Calculations:

(1.19.24)   **LL1** = L11*VX0 + L12*VY0 + L13*VZ0; <1>
(1.19.24)   **LL2** = L21*VX0 + L22*VY0 + L23*VZ0; <2>
(1.19.24)   **LL3** = L31*VX0 + L32*VY0 + L33*VZ0; <3>
(1. 3.12)   L1 = limA1U(**LL1**);
(1. 3.12)   L2 = limA2U(**LL2**);
(1. 3.12)   L3 = limA3U(**LL3**);
(1.19.24)   **RRLT** = RBK + LR1*L1 + LR2*L2 + LR3*L3; <1>
(1.19.24)   **GGLT** = GBK + LG1*L1 + LG2*L2 + LG3*L3; <2>
(1.19.24)   **BBLT** = BBK + LB1*L1 + LB2*L2 + LB3*L3; <3>
(1. 3.12)   RLT = limA1U(**RRLT**);
(1. 3.12)   GLT = limA2U(**GGLT**);
(1. 3.12)   BLT = limA3U(**BBLT**);
(1.27.16)   **RR0** = R*RLT + IR0*limA1S(**RFC** - R*RLT); <1>
(1.27.16)   **GG0** = G*GLT + IR0*limA2S(**GFC** - G*GLT); <2>
(1.27.16)   **BB0** = B*BLT + IR0*limA3S(**BFC** - B*BLT); <3>
(1.11. 4)   IR1 = limA1U(**RR0**);
(1.11. 4)   IR2 = limA2U(**GG0**);
(1.11. 4)   IR3 = limA3U(**BB0**);
(-. 8. -)   CD0 <- CD1 <- CD2 <- CODE
(0. 8. 0)   R0 <- R1 <- R2 <- limB1(**RR0**);
(0. 8. 0)   G0 <- G1 <- G2 <- limB2(**GG0**);
(0. 8. 0)   B0 <- B1 <- B2 <- limB3(**BB0**);
(1.27. 4)   MAC1 = **RR0**;
(1.27. 4)   MAC2 = **GG0**;
(1.27. 4)   MAC3 = **BB0**;

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0,G0,B0	LB3,
21	R1,G1,B1	RFC
22	R2,G2,B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0,G0,B0	LB3,
21	R1,G1,B1	RFC
22	R2,G2,B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

NCDT — Required cycles:44

Function: Light source calculation

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Calculations:

n=0,1,2 {

$$(1.19.24)\quad LL1n = L11*VXn + L12*VYn + L13*VZn; \langle1\rangle$$
$$(1.19.24)\quad LL2n = L21*VXn + L22*VYn + L23*VZn; \langle2\rangle$$
$$(1.19.24)\quad LL3n = L31*VXn + L32*VYn + L33*VZn; \langle3\rangle$$
$$(1. 3.12)\quad L1n = limA1U(LL1n);$$
$$(1. 3.12)\quad L2n = limA2U(LL2n);$$
$$(1. 3.12)\quad L3n = limA3U(LL3n);$$
$$(1.19.24)\quad RRLTn = RBK + LR1*L1n + LR2*L2n + LR3*L3n; \langle1\rangle$$
$$(1.19.24)\quad GGLTn = GBK + LG1*L1n + LG2*L2n + LG3*L3n; \langle2\rangle$$
$$(1.19.24)\quad BBLTn = BBK + LB1*L1n + LB2*L2n + LB3*L3n; \langle3\rangle$$
$$(1. 3.12)\quad RLTn = limA1U(RRLTn);$$
$$(1. 3.12)\quad GLTn = limA2U(GGLTn);$$
$$(1. 3.12)\quad BLTn = limA3U(BBLTn);$$
$$(1.27.16)\quad RRn = R*RLTn + IR0*limA1S(RFC - R*RLTn); \langle1\rangle$$
$$(1.27.16)\quad GGn = G*GLTn + IR0*limA2S(GFC - G*GLTn); \langle2\rangle$$
$$(1.27.16)\quad BBn = B*BLTn + IR0*limA3S(BFC - B*BLTn); \langle3\rangle$$
$$(-. 8. -)\quad CDn = CODE$$
$$(-. 8. 0)\quad Rn = limB1(RRn); \quad Gn = limB2(GGn);$$
$$(-. 8. 0)\quad Bn = limB3(BBn);$$

}

$$(1.11. 4)\quad IR1 = limA1U(RR2);$$
$$(1.11. 4)\quad IR2 = limA2U(GG2);$$
$$(1.11. 4)\quad IR3 = limA3U(BB2);$$
$$(1.27. 4)\quad MAC1 = RR2;$$
$$(1.27. 4)\quad MAC2 = GG2;$$
$$(1.27. 4)\quad MAC3 = BB2;$$

NCCS

Function: Light source calculation

Required cycles: 17

Calculations:

(1.19.24)	LL1 = L11*VX0 + L12*VY0 + L13*VZ0; <1>
(1.19.24)	LL2 = L21*VX0 + L22*VY0 + L23*VZ0; <2>
(1.19.24)	LL3 = L31*VX0 + L32*VY0 + L33*VZ0; <3>
(1.3.12)	L1 = limA(LL1);
(1.3.12)	L2 = limA(LL2);
(1.3.12)	L3 = limA(LL3);
(1.19.24)	BBLT = RBK + LR1*L1 +LR2*L2 + LR3*L3; <1>
(1.19.24)	GGLT = GBK + LG1*L1 +LG2*L2 + LG3*L3; <2>
(1.19.24)	BBLT = BBK + LB1*L1 +LB2*L2 + LB3*L3; <3>
(1.3.12)	RLT = limA1U(BBLT);
(1.3.12)	GLT = limA2U(GGLT);
(1.3.12)	BLT = limA3U(BBLT);
(1.27.16)	RR0 = R*RLT; <1>
(1.27.16)	GG0 = G*GLT; <2>
(1.27.16)	BB0 = B*BLT; <3>
(1.11.4)	IR1 = limA1U(RR0);
(1.11.4)	IR2 = limA2U(GG0);
(1.11.4)	IR3 = limA3U(BB0);
(-.8.-)	CD0 <- CD1 <- CD2 <- CODE
(0.8.0)	R0 <- R1 <- R2 <- limB1(RR0);
(0.8.0)	G0 <- G1 <- G2 <- limB2(GG0);
(0.8.0)	B0 <- B1 <- B2 <- limB3(BB0);
(1.27.4)	MAC1 = RR0;
(1.27.4)	MAC2 = GG0;
(1.27.4)	MAC3 = BB0;

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33.
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33.
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0,G0,B0	LB3.
21	R1,G1,B1	RFC
22	R2,G2,B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H.
27	MAC3	DQA.
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33.
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33.
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0,G0,B0	LB3.
21	R1,G1,B1	RFC
22	R2,G2,B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H.
27	MAC3	DQA.
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

NCCT — Required cycles: 39

Function: Light source calculation

Calculations:

n=0,1,2 {

(1.19.24)	$LL1n = L11*VXn + L12*VYn + L13*VZn;$	<1>
(1.19.24)	$LL2n = L21*VXn + L22*VYn + L23*VZn;$	<2>
(1.19.24)	$LL3n = L31*VXn + L32*VYn + L33*VZn;$	<3>
(1.3.12)	$L1n = limA1U(LL1n);$	
(1.3.12)	$L2n = limA2U(LL2n);$	
(1.3.12)	$L3n = limA3U(LL3n);$	
(1.19.24)	$RRLTn = RBK + LR1*L1n + LR2*L2n + LR3*L3n;$	<1>
(1.19.24)	$GGLTn = GBK + LG1*L1n + LG2*L2n + LG3*L3n;$	<2>
(1.19.24)	$BBLTn = BBK + LB1*L1n + LB2*L2n + LB3*L3n;$	<3>
(1.3.12)	$RLTn = limA1U(RRLTn);$	
(1.3.12)	$GLTn = limA2U(GGLTn);$	
(1.3.12)	$BLTn = limA3U(BBLTn);$	
(1.27.16)	$BBn = R*RLTn;$	<1>
(1.27.16)	$GGn = G*GLTn;$	<2>
(1.27.16)	$BBn = B*BLTn;$	<3>
(-.8.-)	$CDn = CODE$	
(0.8.0)	$Rn = limB1(BBn);$	
(0.8.0)	$Gn = limB2(GGn);$	
(0.8.0)	$Bn = limB3(BBn);$	

}

(1.11.4)	$IR1 = limA1U(BB2);$ $IR2 = limA2U(GG2);$	
(1.11.4)	$IR3 = limA3U(BB2);$	
(1.27.4)	$MAC1 = BB2;$ $MAC2 = GG2;$	
(1.27.4)	$MAC3 = BB2;$	

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

CDP

Function: Light source calculation

Required cycles: 13

Calculations:

(1.19.24)	RRLT = RBK + LR1*IR1 + LR2*IR2 + LR3*IR3; <1>
(1.19.24)	GGLT = QBK + LG1*IR1 + LG2*IR2 + LG3*IR3; <2>
(1.19.24)	BBLT = BBK + LB1*IR1 + LB2*IR2 + LB3*IR3; <3>
(1. 3.12)	RLT = limA1U(RRLT);
(1. 3.12)	GLT = limA2U(GGLT);
(1. 3.12)	BLT = limA3U(BBLT);
(1.27.16)	RR0 = R*RLT + IR0*limA1S(RFC - R*RLT); <1>
(1.27.16)	GG0 = G*GLT + IR0*limA2S(GFC - G*GLT); <2>
(1.27.16)	BB0 = B*BLT + IR0*limA3S(BFC - B*BLT); <3>
(1.11. 4)	IR1 = limA1U(RR0);
(1.11. 4)	IR2 = limA2U(GG0);
(1.11. 4)	IR3 = limA3U(BB0);
(-. 8. -)	CD0 <- CD1 <- CD2 <- CODE
(0. 8. 0)	R0 <- R1 <- R2 <- limB1(RR0);
(0. 8. 0)	G0 <- G1 <- G2 <- limB2(GG0);
(0. 8. 0)	B0 <- B1 <- B2 <- limB3(BB0);
(1.27. 4)	MAC1 = RR0;
(1.27. 4)	MAC2 = GG0;
(1.27. 4)	MAC3 = BB0;

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZ0(1)	LR1,LR2
17	SZ1(2)	LR3,LG1
18	SZ2(3)	LG2,LG3
19	R0 G0 B0	LB1,LB2
20	R1 G1 B1	LB3,
21	R2 G2 B2	RFC
22		GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZ0(1)	LR1,LR2
17	SZ1(2)	LR3,LG1
18	SZ2(3)	LG2,LG3
19	R0 G0 B0	LB1,LB2
20	R1 G1 B1	LB3,
21	R2 G2 B2	RFC
22		GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

CC   Required cycles: 11

Function: Light source calculation

Calculations:

(1.19.24)	RBLT = RBK + LR1*IR1 + LR2*IR2 + LR3*IR3; <1>
(1.19.24)	GGLT = GBK + LG1*IR1 + LG2*IR2 + LG3*IR3; <2>
(1.19.24)	BBLT = BBK + LB1*IR1 + LB2*IR2 + LB3*IR3; <3>
(1. 3.12)	RLT = limA1U(RBLT);
(1. 3.12)	GLT = limA2U(GGLT);
(1. 3.12)	BLT = limA3U(BBLT);
(1.27.16)	RR0 = R*RLT; <1>
(1.27.16)	GG0 = G*GLT; <2>
(1.27.16)	BB0 = B*BLT; <3>
(1.11. 4)	IR1 = limA1U(RR0);
(1.11. 4)	IR2 = limA2U(GG0);
(1.11. 4)	IR3 = limA3U(BB0);
(- 8. -)	CD0 <- CD1 <- CD2 <- CODE
(0. 8. 0)	R0 <- R1 <- R2 <- limB1(RR0);
(0. 8. 0)	G0 <- G1 <- G2 <- limB2(GG0);
(0. 8. 0)	B0 <- B1 <- B2 <- limB3(BB0);
(1.27. 4)	MAC1 = RR0;
(1.27. 4)	MAC2 = GG0;
(1.27. 4)	MAC3 = BB0;

Referenced registers:

	Data	Control		Data	Control
0	VX0,VY0	R11,R12	16	SZx(0)	LR1,LR2
1	VZ0	R13,R21	17	SZ0(1)	LR3,LG1
2	VX1,VY1	R22,R23	18	SZ1(2)	LG2,LG3
3	VZ1	R31,R32	19	SZ2(3)	LB1,LB2
4	VX2,VY2	R33,	20	R0 G0 B0	LB3,
5	VZ2	TRX	21	R1 Q1 B1	RFC
6	RGB CODE	TRY	22	R2 Q2 B2	QFC
7	OTZ	TRZ	23		BFC
8	IR0	L11,L12	24	MAC0	OFX
9	IR1	L13,L21	25	MAC1	OPY
10	IR2	L22,L23	26	MAC2	H,
11	IR3	L31,L32	27	MAC3	DQA,
12	SX0,SY0	L33,	28	IRGB	DQB
13	SX1,SY1	RBK	29	ORGB	ZSF3,
14	SX2,SY2	QBK	30	DATA32	ZSF4,
15	SX2P,SY2P	BBK	31	LZC	FLAG

Modified registers:

	Data	Control		Data	Control
0	VX0,VY0	R11,R12	16	SZx(0)	LR1,LR2
1	VZ0	R13,R21	17	SZ0(1)	LR3,LG1
2	VX1,VY1	R22,R23	18	SZ1(2)	LG2,LG3
3	VZ1	R31,R32	19	SZ2(3)	LB1,LB2
4	VX2,VY2	R33,	20	R0 G0 B0	LB3,
5	VZ2	TRX	21	R1 Q1 B1	RFC
6	RGB CODE	TRY	22	R2 Q2 B2	QFC
7	OTZ	TRZ	23		BFC
8	IR0	L11,L12	24	MAC0	OFX
9	IR1	L13,L21	25	MAC1	OPY
10	IR2	L22,L23	26	MAC2	H,
11	IR3	L31,L32	27	MAC3	DQA,
12	SX0,SY0	L33,	28	IRGB	DQB
13	SX1,SY1	RBK	29	ORGB	ZSF3,
14	SX2,SY2	QBK	30	DATA32	ZSF4,
15	SX2P,SY2P	BBK	31	LZC	FLAG

Required cycles: 14

Function: Light source calculation

Calculations:

(1.19.24) LL1 = L11*VX0 + L12*VY0 + L13*VZ0; <1>
(1.19.24) LL2 = L21*VX0 + L22*VY0 + L23*VZ0; <2>
(1.19.24) LL3 = L31*VX0 + L32*VY0 + L33*VZ0; <3>
(1. 3.12) L1 = limA1U(LL1);
(1. 3.12) L2 = limA2U(LL2);
(1. 3.12) L3 = limA3U(LL3);
(1.19.24) BB0 = BBK + LB1*L1 + LB2*L2 + LB3*L3; <3>
(1.19.24) GG0 = GBK + LG1*L1 + LG2*L2 + LG3*L3; <2>
(1.19.24) RR0 = RBK + LR1*L1 + LR2*L2 + LR3*L3; <1>
(1. 3.12) IR1 = limA1U(RR0);
(1. 3.12) IR2 = limA2U(GG0);
(1. 3.12) IR3 = limA3U(BB0);
(-.8. -) CD0 <- CD1 <- CD2 <- CODE
(0. 0. 8) R0 <- R1 <- R2 <- limB1(RR0);
(0. 0. 8) G0 <- G1 <- G2 <- limB2(GG0);
(0. 0. 8) B0 <- B1 <- B2 <- limB3(BB0);
(1.19.12) MAC1 = RR0;
(1.19.12) MAC2 = GG0;
(1.19.12) MAC3 = BB0;

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB COD	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0,G0,B0	LB3,
21	R1,G1,B1	RFC
22	R2,G2,B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

NCT — Required cycles: 30

Function: Light source calculation

Calculations:

n=0,1,2 {

(1.19.24)	$LL1n = L11*VXn + L12*VYn + L13*VZn;$ <1>	
(1.19.24)	$LL2n = L21*VXn + L22*VYn + L23*VZn;$ <2>	
(1.19.24)	$LL3n = L31*VXn + L32*VYn + L33*VZn;$ <3>	
(1.3.12)	$L1n = limA1U(LL1n);$	
(1.3.12)	$L2n = limA2U(LL2n);$	
(1.3.12)	$L3n = limA3U(LL3n);$	
(1.19.24)	$RRn = RBK + LR1*L1n + LR2*L2n + LR3*L3n;$ <1>	
(1.19.24)	$GGn = GBK + LG1*L1n + LG2*L2n + LG3*L3n;$ <2>	
(1.19.24)	$BBn = BBK + LB1*L1n + LB2*L2n + LB3*L3n;$ <3>	
(-.8.-)	$CDn = CODE$	
(0.0.8)	$Rn = limB1(RRn);$	
(0.0.8)	$Gn = limB2(GGn);$	
(0.0.8)	$Bn = limB3(BBn);$	

}

(1.3.12)	IR1	$= limA1U(RR2);$
(1.3.12)	IR2	$= limA2U(GG2);$
(1.3.12)	IR3	$= limA3U(BB2);$
(1.19.12)	MAC1	$= RR2;$
(1.19.12)	MAC2	$= GG2;$
(1.19.12)	MAC3	$= BB2;$

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB COD	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	QFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	QFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Function: Matrix and vector multiplication

Items specified using arguments:

Argument	Specified content	Value=0	Value = 1	Value=2	Value = 3
sf	Scaling format	Scale large	Scale small	Not valid	Not valid
mx	Multiplication array (MX) (1.3.12)	R	L	LR	Not valid
v	Multiplication vector (V) (1.m.n)	Vp0 p=X/Y/Z	Vp1 p=X/Y/Z	Vp2 p=X/Y/Z	IRp p=0/1/2
cv	Addition vector (CV) (1.16+m.n)	TRp p=X/Y/Z	pBK p=R/B/G	pFC p=R/B/G	IRp p=0/1/2
lm	Limiter A1/2/3 lower limit	-2^15	0	Not valid	0

* Data formats

The multiplication matrix data format is fixed.

The other data formats are determined by the multiplication vector data format.

Calculations: (m and n are determined by the multiplication vector data format.)

MT1 = CV1 + MX11*V1 + MX12*V2 + MX13*V3; <1>
MT2 = CV2 + MX21*V1 + MX22*V2 + MX23*V3; <2>
MT3 = CV3 + MX31*V1 + MX32*V2 + MX33*V3; <3>

MAC1 = MT1
MAC2 = MT2
MAC3 = MT3

sf == 0	sf == 1	
(1.16+m.n+12)	(1.m.n)	
(1.m-12.n+12)	(1.m.n)	IR1 = limA1C(MT1);
(1.m-12.n+12)	(1.m.n)	IR2 = limA2C(MT2)
(1.m-12.n+12)	(1.m.n)	IR3 = limA3C(MT3)
(1.16+m.n+12)		
(1.16+m.n)		
(1.16+m.n)		
(1.16+m.n)		

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB_CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H.
27	MAC3	DQA.
28	IRGB	DQB
29	ORGB	ZSF3.
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB_CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H.
27	MAC3	DQA.
28	IRGB	DQB
29	ORGB	ZSF3.
30	DATA32	ZSF4,
31	LZC	FLAG

DCPL   Required cycles: 8

Function: Depth cueing

Calculations:

(1.27.16)	RR0 = R*IR1 + IR0*limA1S(RFC - R*IR1); <1>
(1.27.16)	GG0 = G*IR2 + IR0*limA2S(GFC - G*IR2); <2>
(1.27.16)	BB0 = B*IR3 + IR0*limA3S(BFC - B*IR3); <3>
(1.11. 4)	IR1 = limA1S(RR0);
(1.11. 4)	IR2 = limA2S(QQ0);
(1.11. 4)	IR3 = limA3S(BB0);
(-. 8. -)	CD0 <- CD1 <- CD2 <- CODE
(0. 8. 0)	R0 <- R1 <- R2 <- limB1(RR0);
(0. 8. 0)	G0 <- G1 <- G2 <- limB2(QQ0);
(0. 8. 0)	B0 <- B1 <- B2 <- limB3(BB0);
(1.27. 4)	MAC1 = RR0;
(1.27. 4)	MAC2 = QQ0;
(1.27. 4)	MAC3 = BB0;

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

INTPL

Required cycles: 8

Function: Interpolation

Calculations: (m and n request the data format of IRp(p=1,2,3) as (1.m.n).)

(1.m.n.)

(1.16+m.n+12) $IPL1 = 1.0*IR1 + IR0*limA1S(RFC-1.0*IR1);$ <1>
(1.16+m.n+12) $IPL2 = 1.0*IR2 + IR0*limA2S(GFC-1.0*IR2);$ <2>
(1.16+m.n+12) $IPL3 = 1.0*IR3 + IR0*limA3S(BFC-1.0*IR3);$ <3>

(1.   m.   n) $IR1 = limA1S(IPL1);$
(1.   m.   n) $IR2 = limA2S(IPL2);$
(1.   m.   n) $IR3 = limA3S(IPL3);$

(-.   8.   -) $CD0 <- CD1 = CD2 = CODE$
(0.12-n. n-4) $R0 <- R1 <- R2 <- limB1(IPL1);$
(0.12-n. n-4) $G0 <- G1 <- G2 <- limB2(IPL2);$
(0.12-n. n-4) $B0 <- B1 <- B2 <- limB3(IPL3);$

(1.16+m. n) $MAC1 = IPL1;$
(1.16+m. n) $MAC2 = IPL2;$
(1.16+m. n) $MAC3 = IPL3;$

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB COD	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LQ1
18	SZ1(2)	LQ2,LQ3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LQ1
18	SZ1(2)	LQ2,LQ3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

DPCS   **Required cycles: 8**

Function: Depth cueing

Calculations:

(1.27.16)	$RR0 = R*1.0 + IR0*limA1S(RFC-R*1.0);$ <1>
(1.27.16)	$GG0 = G*1.0 + IR0*limA2S(QFC-G*1.0);$ <2>
(1.27.16)	$BB0 = B*1.0 + IR0*limA3S(BFC-B*1.0);$ <3>
(1.11.4)	$IR1 = limA1S(RR0);$
(1.11.4)	$IR2 = limA2S(GG0);$
(1.11.4)	$IR3 = limA3S(BB0);$
(-.8.-)	$CD0 <- CD1 <- CD2 <- CODE$
(0.8.0)	$R0 <- R1 <- R2 <- limB1(RR0);$
(0.8.0)	$G0 <- G1 <- G2 <- limB2(GG0);$
(0.8.0)	$B0 <- B1 <- B2 <- limB3(BB0);$
(1.27.4)	$MAC1 = RR0;$
(1.27.4)	$MAC2 = GG0;$
(1.27.4)	$MAC3 = BB0;$

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	QFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	QFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Function: Depth cueing

Calculations:

n=0,1,2 {

(1.27.16) BBn = Rn*1.0 + IR0*limA1S(RFC-R*1.0); <1>
(1.27.16) GGn = Gn*1.0 + IR0*limA2S(GFC-G*1.0); <2>
(1.27.16) BBn = Bn*1.0 + IR0*limA3S(BFC-B*1.0); <3>
(1.11.4) IR1 = limA1S(RRn);
(1.11.4) IR2 = limA2S(GGn);
(1.11.4) IR3 = limA3S(BB2);
(-.8.-) CDn = CODE
(0.8.0) Rn = limB1(BRn);
(0.8.0) Gn = limB2(GGn);
(0.8.0) Bn = limB3(BBn);
}
(1.27.4) MAC1 = RR2;
(1.27.4) MAC2 = GG2;
(1.27.4) MAC3 = BB2;

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	QBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0,G0,B0	LB3,
21	R1,G1,B1	RFC
22	R2,G2,B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	QBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0,G0,B0	LB3,
21	R1,G1,B1	RFC
22	R2,G2,B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

SQR sf   Required cycles: 5

Function: Vector squaring

Items specified using arguments:

Argument	Specified content	Value=0	Value=1
sf	Output format	–	Performs calculations on data shifted 12 bits to the left in the IRn register.

Calculations: (m and n request the data format of IRp(p=1,2,3) as (1.m.n).)

sf == 0	sf == 1	
(1.m+28.n)	(1.m+16.n+12)	$L1 = IR1*IR1;$ <1>
(1.m+28.n)	(1.m+16.n+12)	$L2 = IR2*IR2;$ <2>
(1.m+28.n)	(1.m+16.n+12)	$L3 = IR3*IR3;$ <3>
(1.m .n)	(1.m+16.n+12)	$IR1 = limA1U(L1);$
(1.m .n)	(1.m+16.n+12)	$IR2 = limA2U(L2);$
(1.m .n)	(1.m+16.n+12)	$IR3 = limA3U(L3);$
(1.m+16.0)	(1.m+16.n+12)	$MAC1 = L1;$
(1.m+16.0)	(1.m+16.n+12)	$MAC2 = L2;$
(1.m+16.0)	(1.m+16.n+12)	$MAC3 = L3;$

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Function: Z-averaging

Calculations:

(1.31.21)

$$OOTZ = ZSF3*SZ0(1)$$
$$+ ZSF3*SZ1(2)$$
$$+ ZSF3*SZ2(3); <4>$$

(0.16. 0)   OTZ = limC(OOTZ);

(1.31. 0)   MAC0 = OOTZ;

Referenced registers:

	Data	Control
0	VX0.VY0	R11.R12
1	VZ0	R13.R21
2	VX1.VY1	R22.R23
3	VZ1	R31.R32
4	VX2.VY2	R33.
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11.L12
9	IR1	L13.L21
10	IR2	L22.L23
11	IR3	L31.L32
12	SX0.SY0	L33.
13	SX1.SY1	RBK
14	SX2.SY2	GBK
15	SX2P.SY2P	BBK
16	SZX(0)	LR1.LR2
17	SZ0(1)	LR3.LG1
18	SZ1(2)	LG2.LG3
19	SZ2(3)	LB1.LB2
20	R0 G0 B0	LB3.
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H.
27	MAC3	DQA.
28	IRGB	DQB
29	ORGB	ZSF3.
30	DATA32	ZSF4.
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0.VY0	R11.R12
1	VZ0	R13.R21
2	VX1.VY1	R22.R23
3	VZ1	R31.R32
4	VX2.VY2	R33.
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11.L12
9	IR1	L13.L21
10	IR2	L22.L23
11	IR3	L31.L32
12	SX0.SY0	L33.
13	SX1.SY1	RBK
14	SX2.SY2	GBK
15	SX2P.SY2P	BBK
16	SZX(0)	LR1.LR2
17	SZ0(1)	LR3.LG1
18	SZ1(2)	LG2.LG3
19	SZ2(3)	LB1.LB2
20	R0 G0 B0	LB3.
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H.
27	MAC3	DQA.
28	IRGB	DQB
29	ORGB	ZSF3.
30	DATA32	ZSF4.
31	LZC	FLAG

AVSZ4

Required cycles: 6

Function: Z-averaging

Calculations:

$$(1.31.12)\quad OOTZ = ZSF4*SZx(0)$$
$$+ ZSF4*SZo(1)$$
$$+ ZSF4*SZ1(2)$$
$$+ ZSF4*SZZ(3);\ <4>$$

(0.16. 0) OTZ = limC(OOTZ);

(1.31. 0) MAC0 = OOTZ;

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

NCLIP   Required cycles: 8

Function: Normal clipping

Calculations:

(1.43. 0) OPZ = SX0*SY1 + SX1*SY2 + SX2*SY0
           - SX0*SY2 - SX1*SY0 - SX2*SY1; <4>

(1.31. 0) MAC0 = OPZ;

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0,G0,B0	LB3,
21	R1,G1,B1	RFC
22	R2,G2,B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0,G0,B0	LB3,
21	R1,G1,B1	RFC
22	R2,G2,B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

OP sf   Required cycles: 6

Function: Outer product

Items specified using arguments:

Argument	Specified content	Value =0	Value=1
sf	Output format	-	Performs calculations on data shifted 12 bits to the left in the IRn register.

Calculations:: (m and n request the data format of IRp(p=1,2,3) as (1.m.n).)

sf == 0	sf == 1	
(1.m.n)	(1.m+16.n+12)	$OPX = DY1(R22)*DZ2(IR3)$ $- DZ1(R33)*DY2(IR2); <1>$
(1.m+28.n)	(1.m+16.n+12)	$OPY = DZ1(R33)*DX2(IR1)$ $- DX1(R11)*DZ2(IR3); <2>$
(1.m+28.n)	(1.m+16.n+12)	$OPZ = DX1(R11)*DY2(IR2)$ $- DY1(R22)*DX2(IR1); <3>$
(1.m .n)	(1.m .n)	IR1 = limA1S(OPX);
(1.m .n)	(1.m .n)	IR2 = limA2S(OPY);
(1.m .n)	(1.m .n)	IR3 = limA3S(OPZ);
(1.m+16.n)	(1.m+16.n)	MAC1 = OPX;
(1.m+16.n)	(1.m+16.n)	MAC2 = OPY;
(1.m+16.n)	(1.m+16.n)	MAC3 = OPZ;

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R93,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

QPF sf

Required cycles: 5

Function: General purpose interpolation

Items specified using arguments:

Argument	Specified content	Value	Value=1
		Value=0	
sf	Output format	–	Performs calculations on data shifted 12 bits to the left in the IRn register.

Calculations:: (m and n request the data format of IRp(p−1,2,3) as (1.m,n).)

sf == 0		sf == 1	
(1.m+28.n)	(1.m+16.n+12)	IPX = IR0*IR1; <1>	
(1.m+28.n)	(1.m+16.n+12)	IPY = IR0*IR2; <2>	
(1.m+28.n)	(1.m+16.n+12)	IPZ = IR0*IR3; <3>	
(1.m .n)	(1.m .n)	IR1 = limA1S(IPX);	
(1.m .n)	(1.m .n)	R2 = limA2S(IPY);	
(1.m .n)	(1.m .n)	IR3 = limA3S(IPZ);	
(1.m+16.n)	(1.m+16.n)	MAC1 = IPX;	
(1.m+16.n)	(1.m+16.n)	MAC2 = IPY;	
(1.m+16.n)	(1.m+16.n)	MAC3 = IPZ;	

(–. 8. –)	CD0 <− CD1 <− CD2 <− CODE
(0. 0. 8)	R0 <− R1 <− R2 <− limB1(IPX);
(0. 0. 8)	G0 <− G1 <− G2 <− limB2(IPY);
(0. 0. 8)	B0 <− B1 <− B2 <− limB3(IPZ);

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12,
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB COD	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1,	L13,L21
10	IR2,	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	GBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

GPL sf — Required cycles: 5

Function: General purpose interpolation

Items specified using arguments:

Argument	Specified content	Value=0	Value=1
sf	Output format	-	Performs calculations on data shifted 12 bits to the left in the IRn register.

Calculations:: (m and n request the data format of IRp(p=1,2,3) as (1.m.n).)

sf == 0	sf == 1	
(1.m+28.n)	(1.m+16.n+12)	$IPX = MAC1 + IR0*IR1$; <1>
(1.m+28.n)	(1.m+16.n+12)	$IPY = MAC2 + IR0*IR2$; <2>
(1.m+28.n)	(1.m+16.n+12)	$IPZ = MAC3 + IR0*IR3$; <3>
(1.m .n)	(1.m .n)	IR1 = limA1S(IPX);
(1.m .n)	(1.m .n)	IR2 = limA2S(IPY);
(1.m .n)	(1.m .n)	IR3 = limA3S(IPZ);
(1.m+16.n)	(1.m+16.n)	MAC1 = IPX;
(1.m+16.n)	(1.m+16.n)	MAC2 = IPY;
(1.m+16.n)	(1.m+16.n)	MAC3 = IPZ;

(-. 8. -)	CD0 <- CD1 <- CD2 <- CODE
(0. 0. 8)	R0 <- R1 <- R2 <- limB1(IPX);
(0. 0. 8)	G0 <- G1 <- G2 <- limB2(IPY);
(0. 0. 8)	B0 <- B1 <- B2 <- limB3(IPZ);

Referenced registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB COD	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	QBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG

Modified registers:

	Data	Control
0	VX0,VY0	R11,R12
1	VZ0	R13,R21
2	VX1,VY1	R22,R23
3	VZ1	R31,R32
4	VX2,VY2	R33,
5	VZ2	TRX
6	RGB CODE	TRY
7	OTZ	TRZ
8	IR0	L11,L12
9	IR1	L13,L21
10	IR2	L22,L23
11	IR3	L31,L32
12	SX0,SY0	L33,
13	SX1,SY1	RBK
14	SX2,SY2	QBK
15	SX2P,SY2P	BBK
16	SZx(0)	LR1,LR2
17	SZ0(1)	LR3,LG1
18	SZ1(2)	LG2,LG3
19	SZ2(3)	LB1,LB2
20	R0 G0 B0	LB3,
21	R1 G1 B1	RFC
22	R2 G2 B2	GFC
23		BFC
24	MAC0	OFX
25	MAC1	OPY
26	MAC2	H,
27	MAC3	DQA,
28	IRGB	DQB
29	ORGB	ZSF3,
30	DATA32	ZSF4,
31	LZC	FLAG